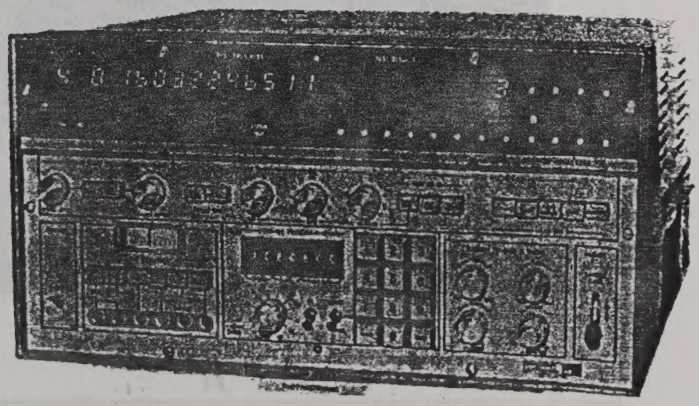
MODEL 41-3A

CENTRAL OFFICE SERVICE ANALYZER

SERVICE MANUAL



Northeast Electronics Instruction Manual
A0041-13-603 Issue 1 February 1980

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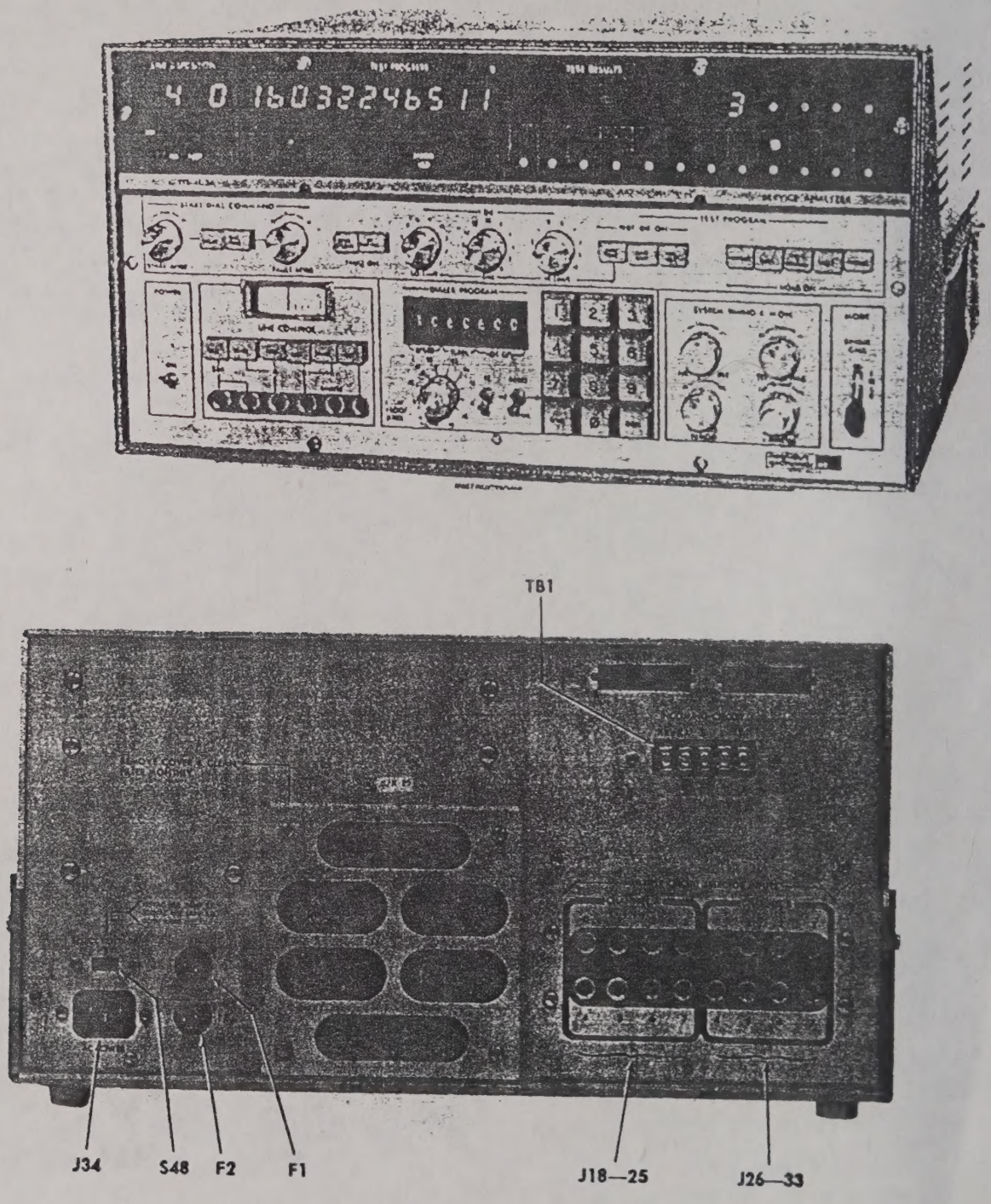

Figure 4—14. Model TTS 41-3A Rear Panel Connectors

METROLOGY CALIBRATION PROCEDURE

MCP

ERS METROLOGY DEPARTMENT

MODEL NUMBER: TTS413A	MANUFACTURE: NEC
PREPAIRED BY:	DATE:
REVIEWED BY: John Billingsley	DATE: 12/17/93
MCP NUMBER: MCP-3823	

STANDARDS LIST

Note: The equipment list below reflects the standards recommended be the calibration procedure of the UUT. Deviations from the recommended standards will be documented on this sheet and a TAR ANALYSIS completed and on file.

UUT:

RECOMMENDED STANDARDS	STANDARDS USED

BASIC MODEL 41-3A SPECIFICATIONS

ORIGINATING LINES	
Line Capacity	16 lines
Line Types	Wet loop T/R or T/R/S leads
Line Impedance	600 or 900 ohms
Sleeve Lead	
Busy Condition	Ground or a potential more positive than −7V
Idle Condition	Open circuit or a potential more negative than −11V (4 volts of hysteresis provided to prevent indecision)
Busy-to-Reselect time	100 +/− ms
Line Seizure (off-hook)	Active hold with 15 mA
DIALING	
Types	Loop dial pulse (DP), Touch-Tone® (TT), or multifrequency (MF)
Digit Capacity	Up to 32 programmed digits and WSD (wait for start dial) commands
Dial Pulsing	
Dial Speed Range	Selectable 1 to 99 pps in 1-pps increments
Dialing Speed Accuracy	+/− 0.1% for 1 to 30 pps range
Percent Break Range	1 to 99% in 1% increments
Percent Break Accuracy	+/− 0.1% for 35% to 85% range over a 1 to 30 pps range
Interdigit Time Range	1 to 999 ms in 1-ms increments
Interdigit Time Accuracy	Better than +/− 1 ms
Transient Suppression	325 +/− 25 Vdc
Touch-Tone® Dialing	
Frequency	Standard dual-frequency tones
Frequency Accuracy	+/− 1%
Single Frequency Output Level	−6.0 +/− 0.5 dBm into 900 ohms
Single Frequency Harmonic Distortion	Less than 3% over a 30-kHz bandwith

TABLE B (Cont'd)

DIALING (Cont'd)	
Dialing Speed	1 to 99 digits per second in 1 digit per second increments
Speed Accuracy	+/− 0.1% for 1 to 30 digits per second
Tone-on Duration	1 to 99% in 1% increments
Duration Accuracy	+/− 1% for 35% to 85% tone-on range over 1 to 30 digits per second range
Multifrequency Dialing	
Type	Standard R1 MF pulsing (KP and ST tones automatically transmitted)
Frequency Accuracy	+/− 1%
Single Frequency Output Level	−6.0 +/− 0.5 dBm into 600 ohms
Single Frequency Harmonic Distortion	Less than 3% over a 30-kHz bandwidth
Dialing Speed	1 to 99 digits per second in 1 digit per second increments
Speed Accuracy	+/− 0.1% for 1 to 30 digits per second
Tone-on Duration	1 to 99% in 1% increments
Duration Accuracy	+/− 1% for 35% to 85% tone-on range over 1 to 30 digits per second range
Twist	1 dB or less
DETECTION CRITERIA	
Answer Supervision	T/R lead reversal lasting longer than approximately 312 ms
Open C-lead	Loss of C-lead ground lasting longer than 512 ms *Note:* When an open C-lead is detected, the Model 41-3A holds the switched connection with approximately 180 mA of sleeve current.
1-kHz Level Detector	
Frequency Range	990 to 1020 Hz

TABLE B (Cont'd)

DETECTION CRITERIA (Cont'd)	
No-tone Threshold	−31 +/− 1 dBm from 600/900 ohms
Response Time	2 +/− 0.5 seconds
Level Limit Accuracy	+/− 0.5 dB from +10 to −10 dBm and +/− 1 dB from −11 to −31 dBm
Busy/Reorder Detector	
Frequency Range	200 to 650 Hz
Sensitivity	−30 dBm from 600/900 ohms
Busy Pulse Modulation Rate	45 to 75 ipm
Reorder Pulse Modulation Rate	100 to 140 ipm
On/Off Level Ratio	Greater than 6 dB
Number of Interruptions	3 for busy tone, 6 for reorder tone
Tone-on Duty Cycle	20 to 80%
Wink/Delay Dialing Detection	Reversed tip/ring polarity present on the line under test for at least 128 milliseconds followed by a return to normal polarity that lasts for at least 200 milliseconds. *Note:* The line under test can be in either the normal or reversed state prior to seizure.
INCOMING CIRCUIT TEST LINE	
Pre-Trip Impedance	Approximately 47 kohms at 20 Hz
Trip Impedance	Approximately 850 ohms at 20 Hz
Trip Criteria	20–60 Hz ringing voltage across T/R leads at 65 volts rms or greater
Quantity of Rings to Trip	1 lasting for more than 600 ms
Sleeve Active (Busy)	Open circuit, ground, or any potential more positive than −7V
Sleeve Inactive (Idle)	Any potential more negative than −11V (4V of hysteresis provided to prevent indecision)
Signal Output	1004 +/− 10 Hz at 0 dBm into 900 ohms

TABLE B (Cont'd)

INTERNAL TRACE TONE	
Frequency	1165 =/− 500 Hz, gated on/off at 4 Hz rate (240 ipm)
Tone-on Level	Approximately 0 dBm into 900 ohms
Loop Holding Resistance	900 +/− 90 ohms dc
DATA STORAGE	
Stored Event Categories	Total test calls Tests on Channel A Tests on Channel B No dial tone (and/or no wink) Open C-lead Reversal during dialing Reorder and answer Busy and answer Reorder (and no answer) Busy (and no answer) Low level No 1-kHz tone High level No answer Incoming circuit fault Test OKs
Storage Capacity	9999 events per category *Note:* Instant recall is provided via individual readout switches. An over-range indication is shown if a register count exceeds 9999 (total tests category) without affecting the contents of other registers.
INPUT POWER	105 to 120 or 215 to 240 Vrms, 50 to 60 Hz, approximately 60 watts
OPERATING ENVIRONMENT	
Temperature	+32°F to +122°F (0°C to +50°C)
Humidity	0% to 90% relative
MECHANICAL	
Size	9 in. h x 17 in. w x 18 in. d (23 cm x 43 cm x 46 cm)
Weight	Approximately 40 pounds (18.2 kg)

TABLE C

ERC SPECIFICATIONS

COMMUNICATION	
Format	Full-duplex, serial asynchronous ASCII
Baud Rate	Selectable 50 to 19200 (factory set at 1200)
Character rate	</= 120 characters per second (maximum baud rate of 1200) for received data
Character bits	1 start bit 7 data bits 1 stop bit for baud rates >/= 134.5 2 stop bits for baud rates </= 110 1 parity bit
Parity code	The Model 41-3A ignores the parity bit when receiving information, and sets the parity bit to zero when transmitting.
INTERFACE PORT	
	RS-232-C and 20-mA loop interfaces on a 25-pin, Type D, female connector (REMOTE TERMINAL port)
Twenty milliamp loop	Must be set for active or passive
RS-232-C	Female DCE type connector converted to male via special null modem cable interconnection
PROGRAMMING	
Call program	Programmable control switch and address instructions
Instructions	256 maximum
Addresses	256 maximum at 32 characters per address instruction
Test calls	1 to 9999 per address
Test call results	User selected reports and data transfer
MEMORY PROTECTION	
	Internal battery backup for preservation of data stored in RAM memory

TABLE C (Cont'd)

MEMORY PROTECTION (Cont'd)	
Battery charge	A minimum 48 hours of continuous unit operation is required to fully charge battery
Minimum protection	10 hours
LEVEL MEASURMENTS	
	Requires C-Message Noise & 1-kHz Level Measurement Option *Note:* The Model 41-3A applies an internal 735-ohm termination to a call origination line while it is in an off-hook condition
C-Message measurement	Milliwatt signal must be present for a minimum interval of 4000 milliseconds, then absent for a minimum interval of 5000 milliseconds
Level range	+15 to +55 dBrnC
Accuracy	+/− 1 dB
1-kHz measurement	Milliwatt signal must be present for a minimum interval of 4000 milliseconds
Level range	−30 to +10 dBm
Accuracy	+/− 1 dB
SIT SIGNAL DETECTION	
	Requires Special Information Tone (SIT) Option
Signal decoding	The SIT detector recognizes all 32 frequency/pulse-width signal codes specified by AT&T Compatibility Bulletin CB154
Tones detected	913.8, 985.2, 1370.6, 1428.5, and 1776.7 Hz with a minimum accuracy of +/− 1.5%
Minimum tone level	−30 dBm at 735 ohms
Minimum acceptable pulse-widths	274 ms +/− 5% 380 ms +/− 5%
Minimum acceptable gap range	0 - 4 ms
PROMPT SIGNAL DETECTION	
	Requires SIT Option

TEST SET INSTRUCTIONS

Unit Name 41-3A TSI No. 41229

Assembly No. 0041-13-001 Issue Date 8/31/77

EQUIPMENT REQUIRED

1. TTS-44
2. 1260A
3. DVM (WESTON)
4. HOLD COIL CKT.
5. HIGH VOLTAGE POWER SUPPLY (150V AT 50ma)
6. BUSY AND RECORDER SIMILATOR
7. A-RELAY FIXTURE
8. ± 15V POWER SUPPLY

ISSUE	DATE	DESCRIPTION OF CHANGES	ECO NO.	APPROVED BY:
1	8/31/77	ORIGINAL		R.E. Dudley
	12/14/77	ADDITION OF MF OPTION, CHANGES INTIMING SPEC, CURRENT SPEC. BUSY, REORDER, DIAL TONE, AND PROCEDURE CHANGES. Appendix A and B	388	R.E. Dudley
	1.	Check MCS board. Making sure C lead comes each ~~relay~~ RELAY to stop. also check the Tip + Ring. Tie in 1khz at 0db to test Jack A		

I. POWER CHECKS:

A. Power Supplies:

1. Check that the following points on both power supplies are not shorted to GND.

1a. PSI - B1+, B2+, B3-
PS2 - B1+

2. Check that only the center pin of the 115VAC receptacle is tied to GND.

B. GND:

1. Release all switch on front of unit.

2. Check that none of the sleeves of the Multiple Circuit Selector Inputs (MCSI) are tied to GND.

3. Check that none of the sleeves of the Line Control Unit are tied to GND.

C. 115 VAC:

1. Place power switch to OFF.

2. Select voltage switch to 115 VAC position.

3. Attached power cord.

4. Place power switch ON.

4a. Fan should operate.

D. Voltage Checks:

1. Turn power OFF.

2. Insert extender card into position 12 of the card cage.

3. Turn power ON.

4. Check voltage on Pin C

4a. -12V ± .6VDC

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NE-1001(R)-3T4

5.	Check voltage on Pin 2.	5a. + 5V ± .25 VDC
6.	Check voltage on Pin B.	6a. - 5V ± .25 VDC (A10, U13, PIN 21)
7.	Check voltage on Pin A. CK. LWR. 12V, SUPPLY	7a. +12V ± .6 VDC
8.	Turn Power OFF.	
9.	Remove extender card.	

II. INITIAL TURN ON

A. Readout and LED Check:

1.	Turn power ON.	1a. Power interrup flashing, Test results LED's on, Eight in all readouts, All test progress LED's ON, Busy LED in line despostion area ON.
2.	Press test results reset button.	2a. All LED's except Busy, ~~IDLE~~ and Programm Error OFF. Test results readouts blank.
3.	Depress the Delay, 1KHZ Tone and Test A button. TT/~~E~~MF/DP to DP.	3a. Program Error LED OFF, Line disposition CHAN A readout cycling from 0 to 7.
4.	Dialer program switch to reset, then NORM.	4a. Test progress readouts blank
5.	Depress Test B button.	5a. Both CHAN A & B cycling from 0 to 7.

B. Line Control Unit:

1.	Depress TRACE A button.	1a. CHAN A stops cycling TRACE A lamp ON. Check for a GND on CH.A sleeve. MEAS. W/SIMPSON 2
2.	Depress TRACE B button.	2a. No cycling of either readout Trace B Lamp ON Check for a GND on CH.B sleeve.
3.	Release both TRACE buttons and insert a 310 plug into CHAN A.	3a. Both busy lamps OFF. Both IDLE lamps ON. No cycling of either CHAN.
4.	Release test B button.	

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41-3A

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3.	Start Dial Command Pots fully CCW.	
4.	System timing pots fully CCW.	
5.	Insert a 310 plug into CHAN A. Depress both test buttons.	5a. CHAN A & B IDLE lamps ON.
6.	MODE switch to AUTO.	6a. The 41-3A will alternate between CHAN A and CHAN B with the correct test lamps being ON.
7.	Release TEST B button.	7a. Only CHAN A indicator will cycle with the test lamp going on.
8.	Release TEST A button.	8a. Program Error lamp will go ON.
9.	Depress TEST B button.	9a. Only CHAN B indicator will cycle with the test lamp going on.
10.	MODE switch to IDLE.	
11.	Release DIAL TONE button.	

III. C - LEAD SENSORS:

A. Channel A: (DEPRESS TEST A)

1.	Apply a -7 Volts (ref. to chassis GND) to the sleeve lead of CH A.	1a. The front Panel A lamps will switch from IDLE to BUSY. CH A readouts will jump to next number. * NOTE 1
2.	Remove -7 Volts from sleeve lead of CH A.	2a. The front Panel A lamps will switch from BUSY to IDLE.

B. Channel B: (RELEASE TEST A DEPRESS TEST B)

1.	Apply a -7 Volts to the sleeve lead of CH B.	1a. The front Panel B lamps will switch from IDLE to BUSY. CHB readouts will jump to next number NOTE 1

NOTE 1: CH. A & CH B readouts will alternate with -7V applied to sleeve.

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C. Multiple Circuit Selector Inputs (MCSI);

1. Remove all plugs from the line Control Unit. (TEST A BUTTON MUST BE DEPRESSED)
2. Insert a 310 to GR plug into CHAN A input 0 of the MCSI.

2a. CHAN A indicator on th front panel will read 0
IF NO CONTINUITY, ACTIVATE MODE SWITCH TO AUTO AND THEN BACK TO IDLE.

3. Check continuity from T-R-S of the MCSI and BRIDGE Jack.
4. Repeat steps C.2 through C.3 for remaining 7 circuits.

4a. CHAN A indicator will i dicate correct number f each jack.

5. Insert a 310 to 310 plug into the line bridge. Place mode switch to auto.
6. Depress EXT. Button.

6a. Continuity between T-R- of Bridge Jack and Exte nal Jack.

7. Repeat steps C.2 through C.4 for all CHAN B MCSI Jacks. (RELEASE TEST A, DEPRESS TEST B, AND PLACE MODE SW. TO IDLE.)

7a. All checks and readouts will be on CHAN B inste of CHAN A.

8. Release EXT. Button.

D. Channel Slection:

1. Depress the Dial Tone button.
2. Dialer Program switch to normal.

2. Remove -7 Volts from the sleeve lead of CH B.

2a. The front panel B lamps will switch from BUSY to IDLE.

IV. TRACE TONE GENERATOR:

A. Channel A:

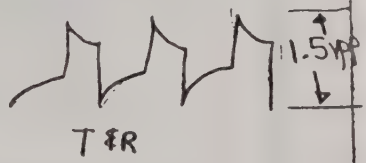
HP3551A

1. Connect a ~~TTS 44~~ 900Ω terminated to CHAN A.

2. Depress TRACE A
Depress TEST A.

N -100dBM

2a. Listen for 1KHZ bleeping sound from the TTS 44.



3. Release TRACE A.

B. Channel B:

1. Repeat steps A.1 to A.2 for CHAN B.

2. Remove the TTS 44 from the 41-3A.

3. Insert a 310 plug into CHAN A Jack.

V. SYSTEM TIMING:

A. Start After Delay:

1. Dialer Program switch to reset and than normal.

2. Insure the start after control fully CCW.

3. MODE switch to AUTO.

3a. A ≤1 sec delay from WAITING FOR START DIAL (WFSD) to WAITING FOR TEST RESULTS (WFTR)

4. Adjust the Start after control fully CW.

4a. A >6 sec delay from WFSD to WFTR.

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5. Loosen the knob and adjust pot for a — 5a. 4 sec. delay ± .5 sec.

6. Tighten knob so pointer points on 4 sec.

7. MODE switch to IDLE.

B. Fault After Delay:

1. Depress the Dial Tone Button.

2. Insure the fault after control fully CCW.

3. MODE switch to AUTO. — 3a. A ≥1 sec dealy from WFSD to ON HOOK.

4. Adjust fault after control to fully CW. — 4a. A >6 sec. delay from WFSD to ON HOOK.

5. Loosen knob and adjust pot for a — 5a. 3 sec ± .4 sec delay.

6. Tighten knob at 3 sec. mark.

C. Recycle Period:

1. Adjust the RECYCLE PERIOD control fully CCW. — 1a. A ≥1 sec. delay from ON HOOK to WFSD.

2. Adjust the recycle period control fully CW. — 2a. A >7 sec. delay from ON HOOK to WFSD.

3. Loosen knob and adjust pot for a — 3a. 4 sec. delay ± .6 sec.

4. Tighten knob at 4 sec. mark.

5. MODE switch to IDLE.

D. Network Delay:

1. Release Dial Tone button.

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2. Depress the fault button.

3. Network Dly. Control fully CCW.

4. MODE switch to AUTO.

4a. A >5 sec. delay from WFTR to system held.

5. Network Delay Control fully CW.

5a. A >43 sec. delay from WFTR to SYSTEM HELD.

6. Loosen knob and adjust pot for a

6a. 15 sec. delay $\pm$ 2 secs.

7. Tighten knob at the 15 sec. mark.

8. MODE switch to IDLE.

VI. DIALING:

A. Dialed Number Loading:

1. Reset switch to reset.

1a. No numbers in the TEST PROCESS readouts.

2. Reset switch to center

3. Enter numbers 1,2,3,4,5, 6,7,8,9,0,1,

3a. The readouts should display the numbers in the proper squence, at half brightness.

4. Reset display.

5. Repeat step A.3 with all 1's, 2's, 3's, ect.

B. % Break:

1. Reset switch to reset, Then to center

2. Enter 0, WSD, 0, WSD 0, WSD etc.

3. Reset switch to NORM.

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4. Enter following, using Dialer Program switches.

   Speed 05
   % Break 09
   IDT 999

5. Connect a 1260 terminated to a Dry Loop mode to 41-3A CHAN A. See Appendix A.

6. Release TEST B button.

7. MODE switch to AUTO. TT-MF-DP switch to DP.

8. The following is a table of switch setting of DIALER PROGRAM.

5a. Meter will read -48V normal zone if not flip reversed on line control unit. (Reversal switch to ~~rear~~ FRONT is normal.)

(PPS)

7a. Speed 5 ± .5
% BRK 9 ∓ .7

8a. Tolerance are:
SPEED ± .5
% BRK ∓ .7

SPEED	%BRK	IDT
05	19	999
05	29	999
05	39	999
05	49	999
05	59	999
05	69	999
05	79	999
05	80	999
05	90	999
05	51	999
11	52	999
12	53	999
13	54	999
14	55	999
15	56	999
06	57	999
07	58	999
08	59	999
09	50	999
10	50	999
20	30	999
30	30	999
40	30	999

NOT NECESSARY TO USE ALL SETTINGS

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NOTE: During dialing the WSD period should always go back to the delay timer setting.

C. Loop + Leak:

1. Set up the ~~1260~~ 93618 as follows: See Appendix B

   SPEED 10
   % BRK 50

2. Pulse the ~~1260~~ 93618 into its own A-Relay.

3. Insert the following Leak combinations.

   LEAK A
   B
   C
   D

3a. Note the Speed and %Break changes.

4. Pulse the Green 41-3A for the following Leak combinations

   LEAK 7.15
   7.5
   10.
   15.

4a. Note the Speed and %Break changes.

5. Release 1260 Loop and Leak buttons. Connect 41-3A to 1260 A-Relay and pulse the same combination of Leak.
   0-WSD-0WSD
   speed 10 %BRK 50
   Mode switch to auto.

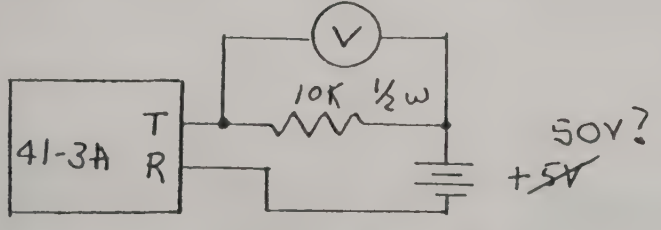
93618 % BK	LEAK	SPEED	1260A % BK
34.8	A	10	34.8
38.0	B	10	43.4
41.0	C	10	43.9
44.1	D	10	46.4
30.7	7.15	10	38.8
32.4	7.5	10	39.3
37.6	10	10	43.0
42.3	15	10	46.4

6. Compare readings.

6a. SPEED ± .5 PPS
% BRK ± .7 %

7. Disconnect from 1260 and Loop switch to normal.

8. Connect the following diagram



9. Set-up the 41-3A as follows:

   SPEED 10
   % BRK 00

10. Mode switch to auto.

11. Insert the following Loop setting.

    LOOP 600
    800
    1000
    1100
    1200
    1300
    1400
    1500
    1600
    1800
    1900

11a. A distinct voltage drop of about .1V will be see between each setting.

12. Mode switch to idle Remove set up. Loop switch to normal.

D. ID Time

1. Program 41-3A to dail all 0's, speed 10 % BRK 50 IDT 999

2. Mode switch to auto

2a. Observe IDT LED

3/ Change IDT to 099

3a. Observe IDT LED flashing at faster speed than 99

4. Change IDT to 009

4a. Observe IDT LED flashing at faster speed than 09

E. DP Dialing:

1. Place the LOAD switch to RESET than LOAD.

2. Program the dialer 1-9 and 0-9,1,2,3,4.

3. TT/DP/MF switch to DP.

4. Connect the 41-3A to a TTS 76.

5. MODE switch to AUTO.

6. The following lamps will go on in sequence.

6a. 1. IDLE lamp to WFSD
2. WFSD lamp to DIALING
3. During dialing the Inter Digital Period lamp will be flashing.
4. Dialing to Dialing Complet and WFTR.

7. Dialing is complete.

7a. The numbers dialed will appe in the proper sequence on TTS 76 display.

NOTE: The TTS 76 has only the ability to display 14 digits so it will be necessary to reset the display sometimes during the dialing.

8. Place the TT/DP/MF switch TT.

E. TT Dialing:

1. Load switch to RESET then load.

2. Program the dialer for digits 1,2,3, WSD, 4,5,6, WSD, 7,8,9, WSD, 0, & E ON.

3. Place the volume control to mid range.

4. MODE switch to AUTO.

5. TT 76 will recieve the digits dial as follows.

5a. 1,2,3, WFSD
4,5,6 WFSD
7,8,9 WFSD
0 WFTR

The touch tone will be heard on the speaker.

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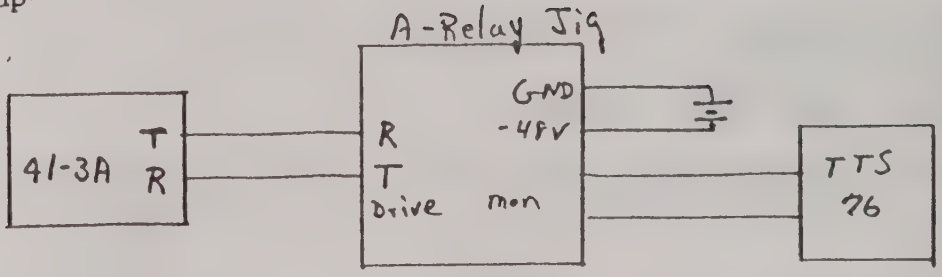
6. Repeat step 5 during a WSD period GND the sleeve of CHAN A.

6a. CHAN A lamps will go IDLE to BUSY.

F. M.F. DIALING (OPTIONAL)

1. Set-up



NOTE: TTS 76 to MF

2. Place the TT/DP/MF switch to MF. NOTE: MF OPTION (U14 ON A10 BD) NOT INSTALLED IN ALL UNITS)

3. Load switch to reset than load.

4. Program the dialer for digits 1,2,3,WSD,4,5,6,WSD,7,8,9,WSD, 0,EON.

5. Load switch to norm. than load

6. Program the dialer for digits 4,5,6.

7. Load switch to norm.

8. Mode switch to Auto

9. TTS 76 will recieve the digits dial as follows:

9a. 1,2,3,WFSD
4,5,6,WFSD
7,8,9,WFSD
0,KP,ST lights from red to green.

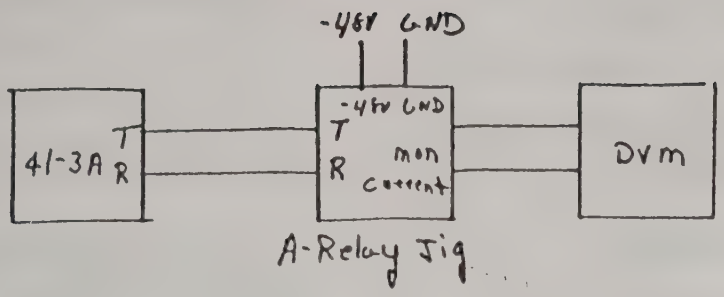
10. Reset the TT 76 after the first number dialed.

11. TTS 76 will recieve the following digits.

11a. 4,5,6.
KP,ST lights from red to green.

VII. D-C LOOP CHARACTERISTICS:

A. Set-up:



A-Relay Jig

1. Enter 0's, WSD in dialer program.

2. Dialer Program
   SPEED 01
   % BRK 00
   IDT 999

3. Test A button depress.

4. TT/DP switch to DP.

5. MODE switch to AUTO.

B. Loop Current:

1. Line Seizure. — 1a. 26ma ± 2ma

2. Make Period. — 2a. ≥ 100ma

3. Dialer Program Changes.
   SPEED 01
   % BRK 99
   IDT 999

4. Break Period. — 4a. < 1ma

5. ID period. — 5a. ≥ 100ma

6. Waiting for test result period — 6a. 26ma ± 2ma

7. Depress fault button.

8. Fault Period. 8a. 26 ma ± 2ma

9. Depress MANUAL BUTTON. 9a. 26 ma ± 2ma

10. TT/DP switch to TT.

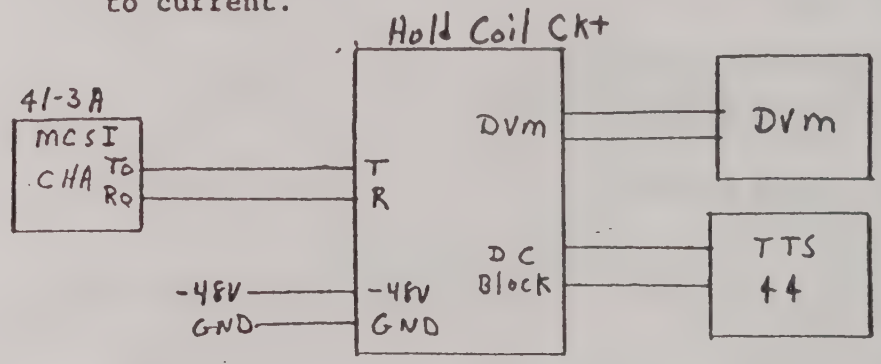
11. TT Dialing. 11a. 26 ma ± 2 ma

C. Test OK Period:

NOTE: IF UNIT IS EQUIPPED WITH THE TTY INTERFACE OPTION THE TEST OK TIME IS LIMITED TO ~5SEC WHEN LOOKING FOR A 1KHZ TONE.

1. Set the TTS 44 to send 0dB signal @ 900Ω terminated.

2. Set up the following HOLD COIL CKT.
   a) Volt/currnet switch to current.



3. TT/DP switch to DP.

4. Load switch to reset then NORM.

5. Power supply to 130V

6. EML Controls to

EML	0
LO LIMIT	2
HI LIMIT	2

7. DVM to current.

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8. MODE switch to AUTO.

8a. TEST OK period 26 ma ± 2 ma.

9. Release Manual button.

10. Test OK time fully CCW.

10a. >.4 sec delay from TEST OK to ON HOOK.

11. Test OK time fully CW.

11a. >8 sec delay from TEST OK to ON HOOK.

12. Loosen knob and adjust pot for a

12a. >5 sec. ± delay.

13. Tighten knob at 5 sec. mark.

14. MODE switch to IDLE.

VIII. 1KHZ DETECTOR:

A. Input Impedance:

1. ~~Connect a DVM across (ACV MODE) the TTS 44 output.~~ → USE 355IA, 900Ω AND MONITOR LEVEL WITH FLUKE 8060A. (-5.4DB)

2. Set up a 1.00VRMS level going into the 41-3A.

3. MODE switch to AUTO.

3a. .440 to .460 VRMS (ADJUST R5 ON A23D IF NECESSARY)
NOTE: ADJUSTMENT MAY EFFECT EML ACCURACY.

4. MODE switch to IDLE.

B. No 1KHZ Tone:

1. DB Controls
LO LIMIT 10
EML 20
HI LIMIT 10

2. Set up a -32dB 1004HZ ±1HZ signal, terminated @900Ω.

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Depress Fault Switch

4. MODE switch to AUTO.

4a. No 1KHZ tone lamp will go on. Fault Alarm will be heard.

5. Depress No 1KHZ Tone button.

5a. 1's will be register in the test results readout.

6. MODE switch to IDLE.

C. Detector:

1. Input Table A as follows:

(a) Set up the TTS 44 for each input level at 1004Hz terminated @ 900Ω.

(c) MODE switch to AUTO.

(d) Adjust the TTS 44 for a TEST OK.

1d. TEST OK lamp will go on and 1's digit will appear in the test result readout.

TABLE A

EML CONTROLS	INPUT LEVEL	TEST OK AREA
10-20-1	-30	-31 to -29
9-20-1	-29	-30 to -28
8-20-1	-28	-29 to -27
7-20-1	-27	-28 to -26
6-20-1	-26	-27 to -25
5-20-1	-25	-26 to -24
4-20-1	-24	-25 to -23
3-20-1	-23	-24 to -22
2-20-1	-22	-23 to -21
1-20-1	-21	-22 to -20
1-18-1	-18	-19 to -17
1-16-1	-16	-17 to -15
1-14-1	-14	-15 to -13
1-12-1	-12	-13 to -11
1-10-1	-10	-11 to - 9
1-8-1	- 8	-8.5 to -7.5
1-6-1	- 6	-6.5 to -5.5
1-4-1	- 4	-4.5 to -3.5
1-2-1	- 2	-2.5 to -1.5

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EML CONTROLS	INPUT LEVEL	TEST OK AREA
1-0-1	0	- .5 to + .5
1-0-2	2	1.5 to +2.5
1-0-3	3	2.5 to +3.5
1-0-4	4	3.5 to 4.5
1-0-5	5	4.5 to 5.5
1-0-6	6	5.5 to 6.5
1-0-7	7	6.5 to 7.5
1-0-8	8	7.5 to 8.5
1-0-9	9	8.5 to 9.5
1-0-10	10	9.5 to 10.5

2. MODE switch to IDLE.

D. Test Results:

EML controls to 1-0-7

1. Input a signal from TTS 44 of 7.6dB as in section C.

2. Depress the reset switch and fault switch.

3. MODE switch to AUTO.

3a. Hi lamps will light ble tone bill be heard.

4. Depress the Hi Level switch.

4a. A 1 will be in the test results readout.

5. Release fault switch.

6. Input a -2dB signal.

7. Depress fault switch.

7a. Lo Level lamp will ligh Bleeping tone heard.

8. Depress the Lo Level switch.

8a. A 1 will appear in the test results readout.

9. Release the fault switch.

10. MODE switch to IDLE.

11. Remove set-up.

IX. FINAL CHECKS

A. Misc. Lamp:

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1. Depress Dial Tone, ~~NO~~ Answer and Test A buttons 30V	1a. Program Error lamp OFF.
2. Dialer Program switch to LOAD.	
3. MODE switch to AUTO.	3a. ON HOOK and PROGRAM ERROR lamp ON.
4. DP switch to NORM.	4a. Program Error and ON HOOK OFF. CHAN A TEST lamp and WFSD lamp ON.
5. MODE switch to IDLE.	
6. Depress CHAN A and CHAN B trace buttons.	
7. MODE switch to AUTO.	7a. ON HOOK lamp ON.
8. Release the TRACE buttons and MODE switch to IDLE.	

B. Dial Tone Fault:

1. Depress the RESET buttons.	
2. Set all timing controls to mid-range.	
3. Depress the FAULT button.	3a. 3 sec. delay the NO DIAL TONE lamp is ON and SYSTEM HELD lamp ON. A digit 1 displayed in the test results readout. Fault Alarm heard.
4. MODE SWITCH TO AUTO	

4. Depress the A button.	4a. 1's digit will register.
5. Depress the B button.	5a. No digit will register.
6. Depress the No Dial Tone button.	6a. 1's digit will register.
7. Depress all other fault buttons and Test Ok buttons.	7a. No digits will register.
8. Depress MANUAL button release the FAULT button.	8a. System still held. Fault alarm stops
9. Release Manual button.	9a. System will recycle to ON HOOK.
10. MODE switch to IDLE. Depress the reset switch.	10a. Test results readout will clear.
11. Release fault button, mode switch to single call.	11a. No dial tone fault lamp will light. fault alarm will not be heard.

C. Open C Lead Fault:

1. Release TEST A button. Mode switch to IDLE	
2. Depress TEST B button. 310 plug in B Jack.	
3. Release DIAL TONE button. Depress DELAY button.	
4. Depress the OPEN C-LEAD and FAULT button.	
5. MODE switch to AUTO.	5a. 4 sec. delay, the Open C-Lead, lamp will be on , 1's recorded in the test result readout. Fault alarm will be heard.
6. Depress B Button.	6a. 1's recorded in Test result readout.
7. Depress all the fault and test ok buttons.	7a. Only Open C-Lead button will register a 1 in the readout.
8. MODE switch to IDLE. Depress reset button.	

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D. No Answer Fault:
Release fault on switches

1. Adjust the network delay fully CCW.

2. Release the ~~1KHZ tone~~ OPEN C LEAD button. Depress the No Answer button. ^ SUPERVISION

3. Dial a number.

3a. After the system timing times out the No Answer lamp will go ON. The fault alarm will be heard. (DEPENDS ON T,R POLARITY)

4. Depress the No Answer button.

4a. 1 digit will register in the test result readout.

5. Depress all other fault buttons.

5a. No digit will register in the test result readout.

6. MODE switch to IDLE. depress reset switch.

E. 1KHZ No Tone Fault:

1. Release the ~~No Answer~~ AUS. SUPV button. Depress the 1KHZ tone button.

2. Dial a number.

2a. No 1KHZ tone lamp will go on. The fault alarm will be heard.

3. Depress the No 1KHZ tone button.

3a. 1's digit will appear in the test result readout.

4. Repeat steps D~~4~~ 5 & ~~5~~ 6.

F. INC CKT Fault:

1. Release the 1KHZ tone button and depress the INC CKT button.

2. Dial a number.

2a. INC CKT fault lamp will go on and fault alarm will be heard.

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3.	Depress the INC CKT fault button.	3a. 1's digit will appear in the test results readout.
4.	Repeat steps D.4 &5.	

G. Busy Fault:

1.	Depress the Busy button. Depress the dial tone button.	
2.	Patch the 41-3A into an outside test line and dial a number to get a busy tone.	2a. After system delay, the BUSY display and system Held lamp will be on.
3.	Depress the BUSY button.	3a. 1's digit will appear in the test results readout.
4.	Repeat steps D.4 & 5.	

H. Reorder Fault: (FAST BUSY, 120 IPM)

1.	Repeat step G using a reorder tone and buttons.	

I. R Or B Answer:

1.	Release the reorder and ~~No Answer~~ INC CKT buttons and depress 1KHZ tone and R or B Answer button.	
2.	Reverse the polarity of the telephone line.	
3.	Dial a number for a reorder tone.	3a. After the sytem delay the Reorder & Answer lamp will be on.
4.	Depress the Reorder Answer button.	4a. 1's digit will appear in the test results readout.
5.	Repeat steps D.4 & 5.	

J. Busy & Answer:

1. Repeat step I for a Busy Signal.

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K. Rev. Drng. Dial Fault:

1.	Release the R or B Answer button.	
2.	Depress the Rev Drng Dial button.	
3.	Set IDT at 321 msec.	
4.	Dial a number for Busy Tone.	4a. Rev. Drng Dialing lamp will light the fault alarm heard.
5.	Depress the REV DRNG DIAL button.	5a. 1's digit will appear in the test results readout.
6.	Repeat steps D.4 & 5.	
7.	Release Dial Tone button.	

X. MISCELLANEOUS:

A. Volume Control:

1.	Apply a 1KHZ 0dBm signal to 41-3A input.	(VERY LOW TONE)
2.	With the unit dialing.	2a. The 1KHZ tone will be heard by turning the Dialing volume control but not with the master control.
3.	Unit has finish dialing.	3a. 1KHZ tone only heard when master control is turned.

B. Talk Facility:

1. MODE switch to IDLE.
2. Release all buttons.
3. Connect a test line to CHAN A input with the TEST A button depress.
4. Depress the DIAL TONE and ~~NO~~ SUPV. ANSWER buttons.

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5. Connect a 52A headset to the 52A jacks.

6. Dial the TEST LINE number with a telephone.

7. Depress TALK button after dialing is complete.

7a. It should now be possible to talk between the 41-3A and the telephone.

8. Remove Set-up.

C. C-Lead Current Check:

1. MODE switch to IDLE.

2. Connect a variable DC power supply with current meter to the sleeve of CHAN A.

-48 on SLV
GND ~~X~~ to Case

3. Adjust power supply for..

3a. -48 V

4. MODE switch to AUTO.

4a. During WFTR period current 150 to 210ma. (~ 180mA)

5. MODE switch to IDLE.

5a. < 3ma

D. INC CKT:

1. Depress the Dial Tone and INC CKT buttons.

2. Connect line #1 on the pocket office into CHAN A input, depress TEST A button.

CHECK:
INCOMMING CKT FAULT OCCURS IF SLEEVE CONNECTED TO MORE NEGATIVE THAN -15V.

3. Connect another line from D17/20 of the pocket office to INC CKT terminals on the rear of unit.

4. Dial up the line (3920). Mode switch single call.

4a. The 41-3A should ring once and the TEST OK lamp will go on.

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5. After OK lamps lights Bridge TTS 44 and counter across INC CKT.

5a. 0dB ± 1004 HZ ± (900Ω) CHECK FOR LOW DIST. SINEWAVE

RISAD- RADJ

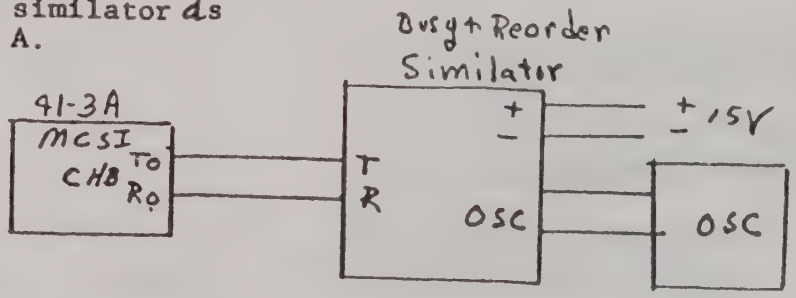
6. MODE switch to IDLE.

6a. No output on the 44 or counter.

E. Busy & Reorder (NOTE: CHECK BY DIALING BUSY (60IPM) AND REORDER (120 IPM) SHOP LINES)

NA

1. Connect the Busy & Reorder similator as in Fig. A.



2. Set Osc. at 400 HZ at -30dBm 900Ω.

3. IPM switch to 45.

4. Depress the Busy and 1KHZ Tone. Release dial tone button, depress delay button.

5. MODE switch to AUTO.

5a. After system delay, the Busy display and system held lamp will be on.

6. MODE switch to IDLE IPM switch to 75. NA

7. MODE switch to AUTO.

7a. Same as 5a.

8. MODE switch to IDLE IPM switch to 120.

9. Depress reorder switch.

10. MODE switch to AUTO.

10a. After system delay, the reorder display and system held lamp will be on.

11. MODE switch to IDLE IPM switch to 140. NA

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QT SERIES
INSTRUCTION MANUAL

NOTICE: The QT Series has been updated to eliminate the, often field misadjusted, current limit and crowbar potentiometers. They have been replaced by precision components. "V" is used in place of "B" as the voltage reference symbol on the revised QT.

INSTALLATION

Mount unit allowing clearance for adequate convection air movement over the chassis surfaces. The power supply mounts in all orientations except with the sides vertically down. Use spacers or cutouts to avoid contact with projecting components. (See outline drawing for unit dimensions.)

INPUT CONNECTIONS

Input connections are made to transformer terminals 1 and 4.
115 VAC input: Jumper transformer terminals 1 to 2 and 3 to 4.
230 VAC input: Jumper transformer terminals 2 to 3 only.

Fuse:	Model	115V	230V
	QT-1	Bussmann MDL-1	Bussmann MDL-1/2
	QT-2	Bussmann MDL-2	Bussmann MDL-1
	QT-3	Bussmann MDL 2 1/2	Bussmann MDX 1 1/4
	QT-4	Bussmann MDX 5	Bussmann MDA 2 1/2

OUTPUT CONNECTIONS

The output connections are made at the Barrier block terminals. Example: B1+ (V1+) is positive output #1... "S" denotes sense...

Remote sensing is accomplished by first removing the links B1+ to S1+ and B1- to S1- under the P.C. card. The revised model has Jumpers on top of the P.C. card (E101 and E102) which must be removed. Connect a 22 ga. pair of twisted wires from S+ and S- to their respective terminals at the load. If oscillation occurs, place a 100mfd capacitor at the load and, if needed, 4.7mfd capacitors S1+ to B1+(V1+) and S1- to B1-(V1-).

Remote control is accomplished by removing the link S1+ to B1+(E101) and applying resistance or voltage across these points. (See Specifications.)

ADJUSTMENTS

	Original QT	Revised QT
Voltage	B1 Adj R112	(V1) adj R109
	B2 & B3 Adj R212	(V2) & (V3) adj R211
Current	B1 adj R105	(V1) not adj (set slightly above 100%)
	B2 not adj	(V2) " "
	B3 not adj	(V3) " "
Crowbar	B1 adj R115	(V1) not adj (set at approx. 6.1V)
(optional)	B2 adj R215	(V2) " (set at approx. 20.5V)
	B3 adj R315	(V3) " "

Caution: Improper adjustments of current or voltage controls can cause damage to the supply.

P.O. BOX 1309, WISSAHICKON AVENUE ■ NORTH WALES, PA 19454
PHONE: 215/699-9261 TWX: 510/661-8061

20.0 16V NF PT NO 960104004

7/10/0 FJL

TROUBLE SHOOTING

Since most malfunctions are a result of semiconductor failure it is simplest to handle field problems by parts replacement. Ohmmeter checks are fully adequate for determining the integrity of transistors, diodes and the like.

WARRANTY

The Deltron standard three year transferrable warranty applies.

NOTE: Return Authorization must be obtained prior to shipping any power supply for repair.

MODELS AND RATINGS

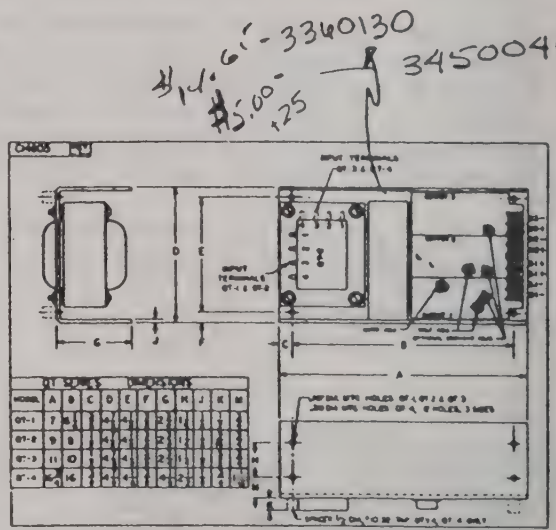
NOTE: Paranthetical figures refer to revised circuit. When "B" is used as the voltage reference symbol, the unit was manufactured prior to revisions.

MODEL	DC OUTPUT			MAXIMUM CURRENT (AMPS) AT AMBIENT TEMPERATURE			
	OUTPUT NO.	DC VOLTS	ADJ. RANGE	40°C	50°C	60°C	71°C
QT-1	B1(V1)	5	±5%	3.0	2.5	2.0	1.5
	B2+3(V2+3)	±12 to ±15	(dual tracking)	0.5	0.45	0.4	0.35
QT-2	Same as above			6.0	5.0	4.0	3.0
				1.0	0.9	0.8	0.7
QT-3	Same as above			9.0	7.5	6.0	4.5
				1.0	0.9	0.8	0.7
QT-4	Same as above			12.0	10.0	8.0	6.0
				3.0	2.7	2.4	2.1

SPECIFICATIONS

Input: 105-125/210-250vac, 47-440 hz. Current ratings are for 57-63 hz. Delete 40°C ratings for 47-57hz.

Line Regulation: 0.1% for full load change
Load Regulation: 0.1% for full line change
Ripple and Noise: 1.5mv; 5mv pk-pk
Temperature Coefficient: 0.03% per °C
Remote Resistance Programming: B1 only - 100 ohms/volt typical
(V1) only - 1000 ohms/volt typical
Remote Voltage Programming: B1(V1) only - one to one voltage change with the programming supply capable of sinking 12 ma.



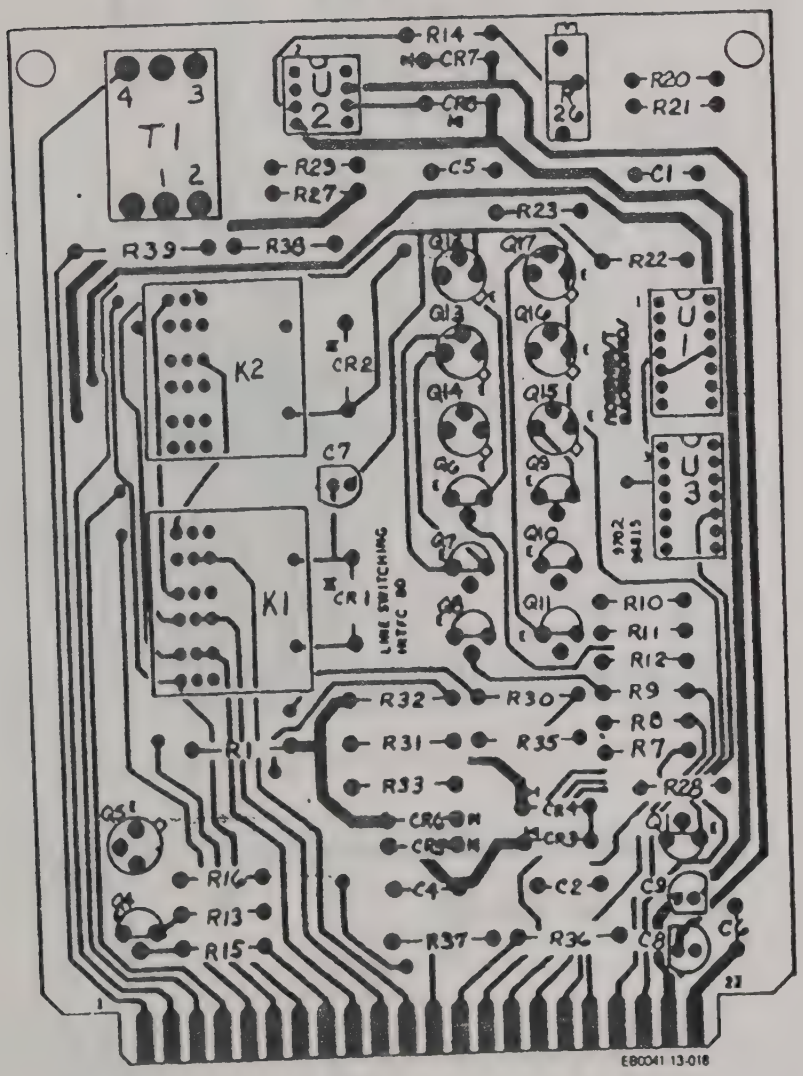


Figure 2—10. Line Switching Interface Component Location Diagram

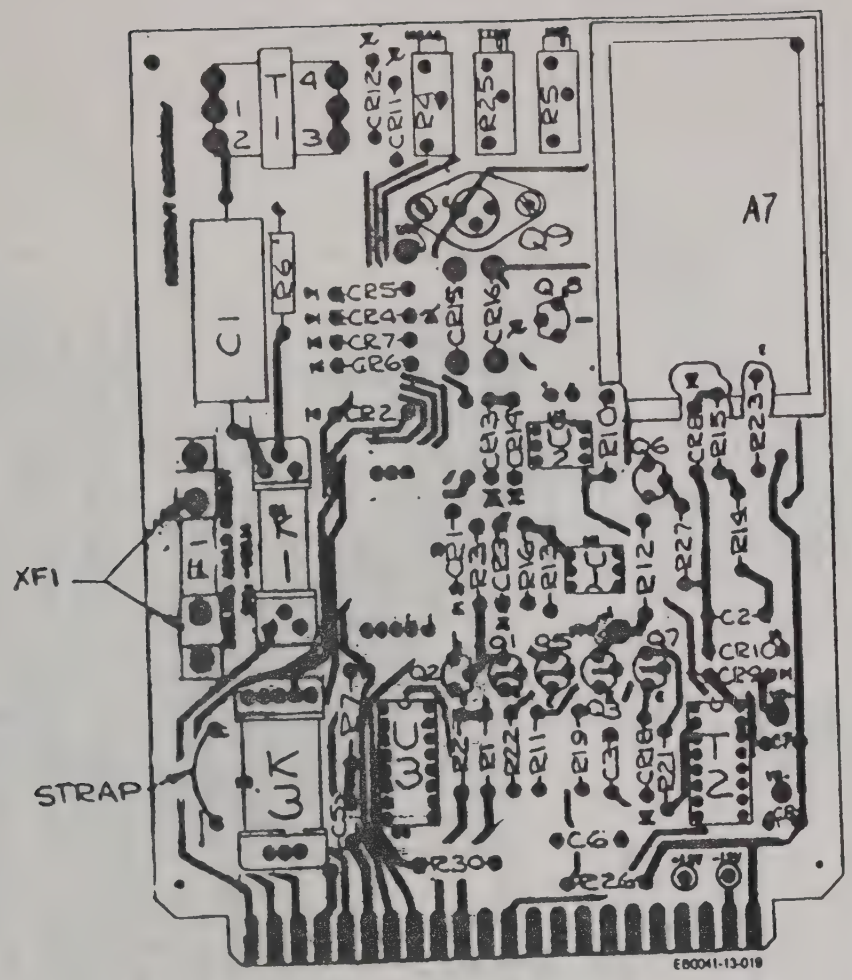


Figure 2—12. Dialing/Hold Component Location Diagram.

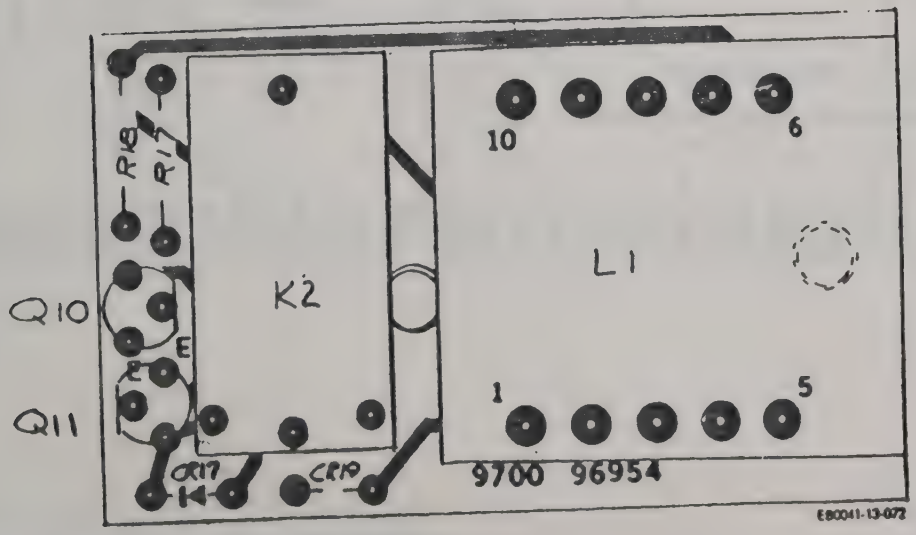


Figure 2—13. L1/Control Board Component Location Diagram.

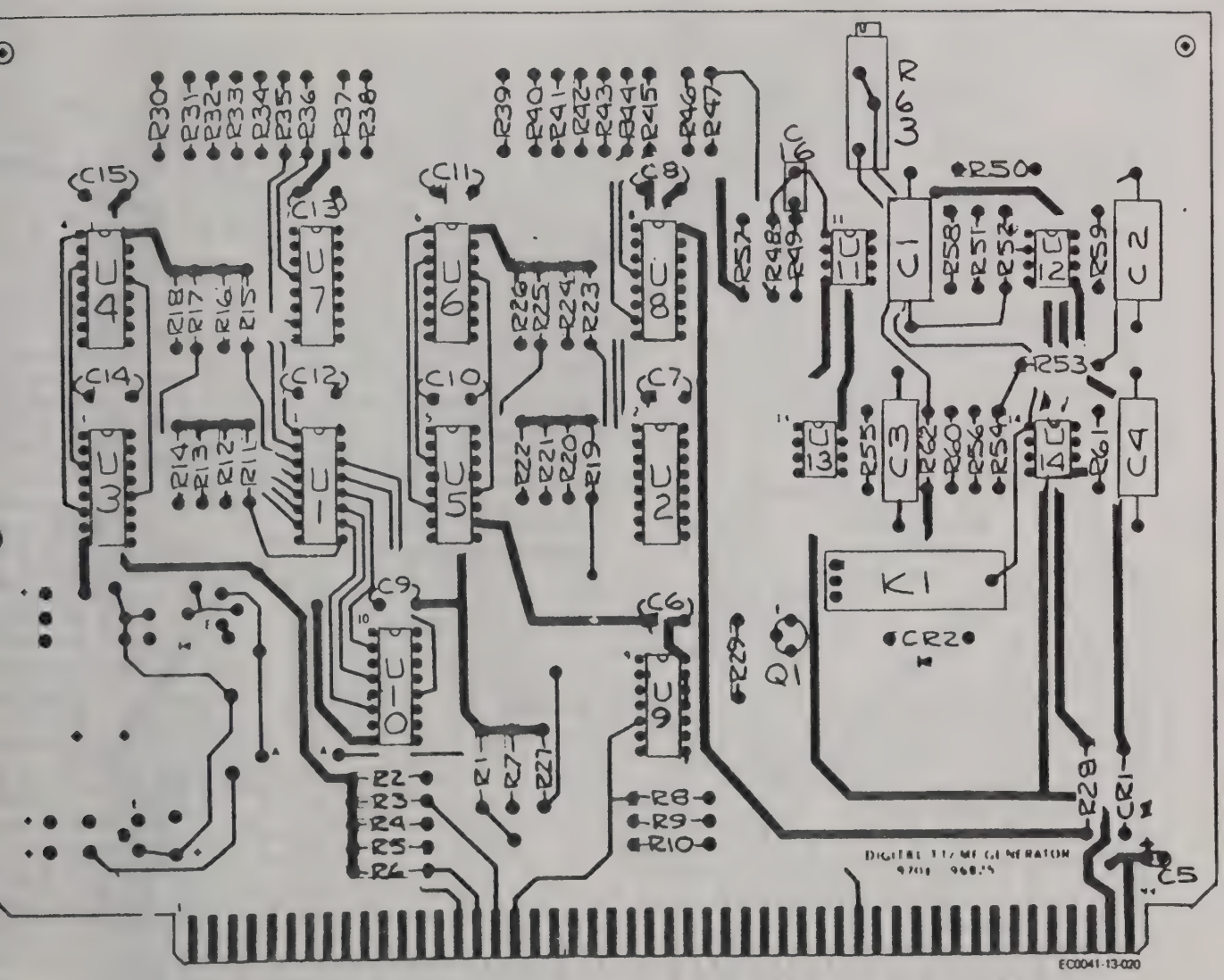


Figure 2—16. Digital TT/MF Generator Component Location Diagram.

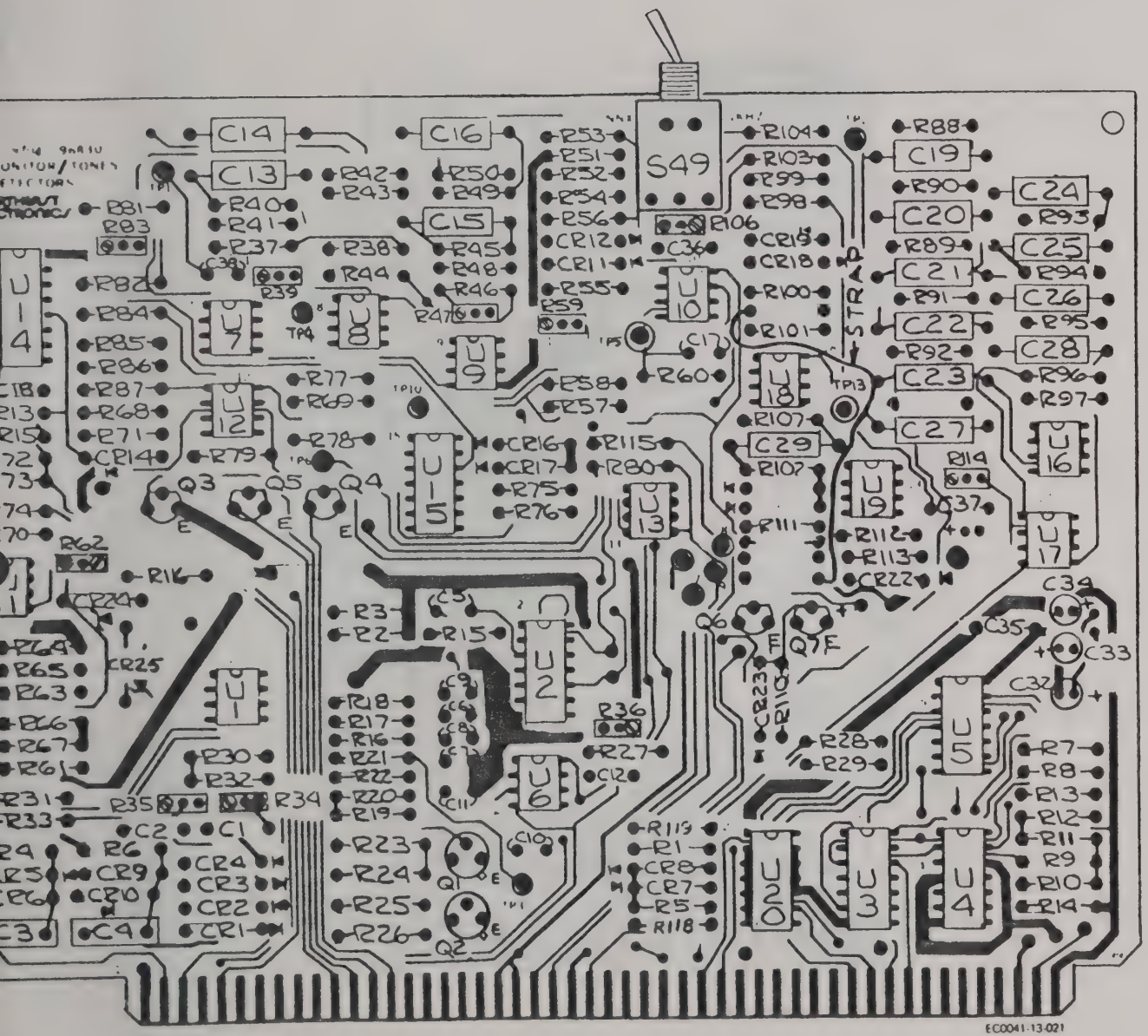


Figure 2—17. Monitor Tones Detector Component Location Diagram.

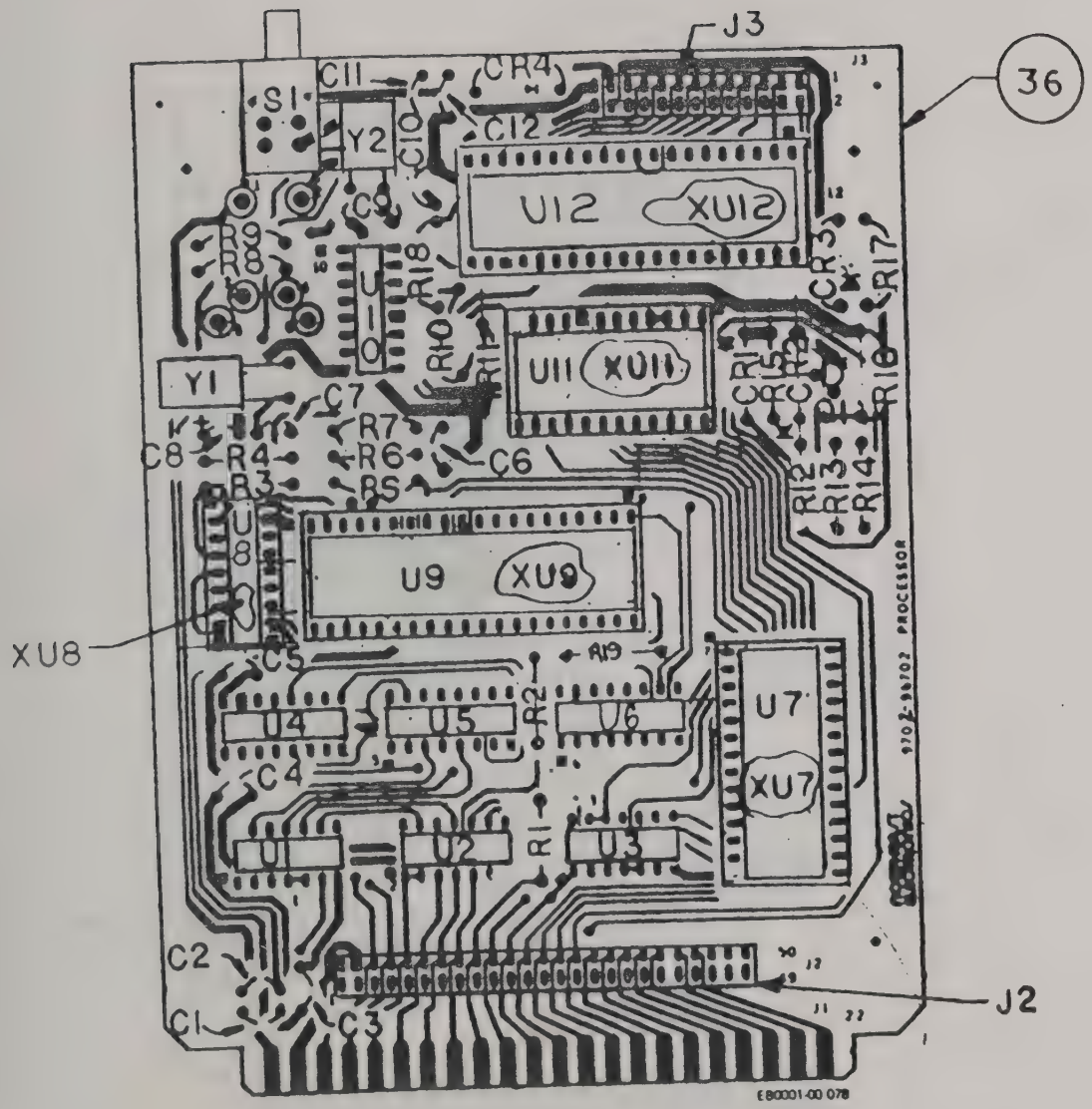
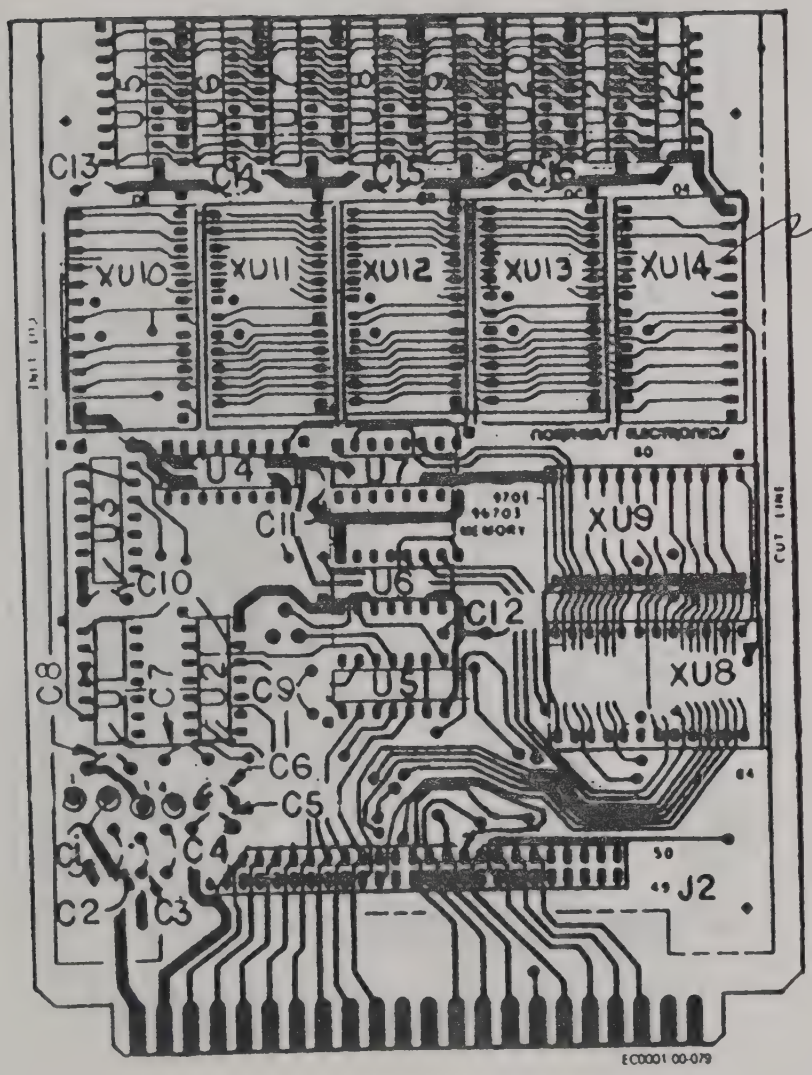


Figure 2–25. Processor Component Location Diagram.



U14
MF option

Figure 2–27. Memory Board Component Location Diagram.

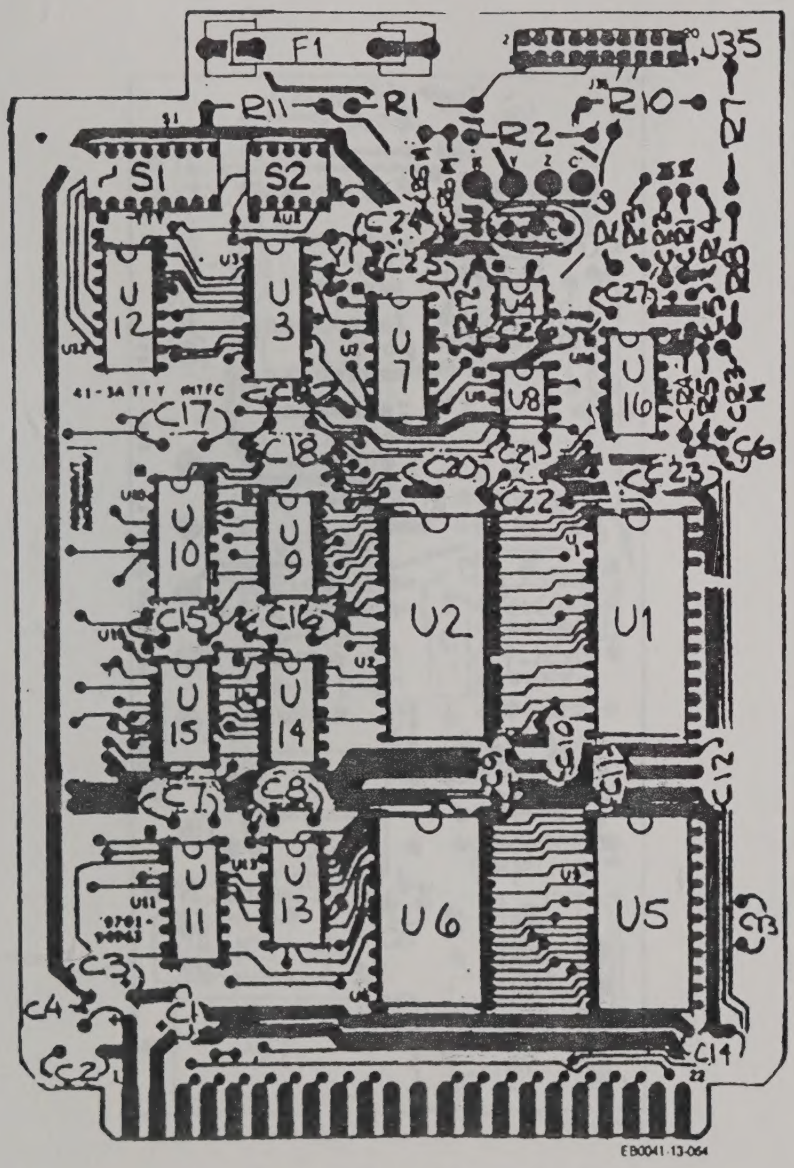
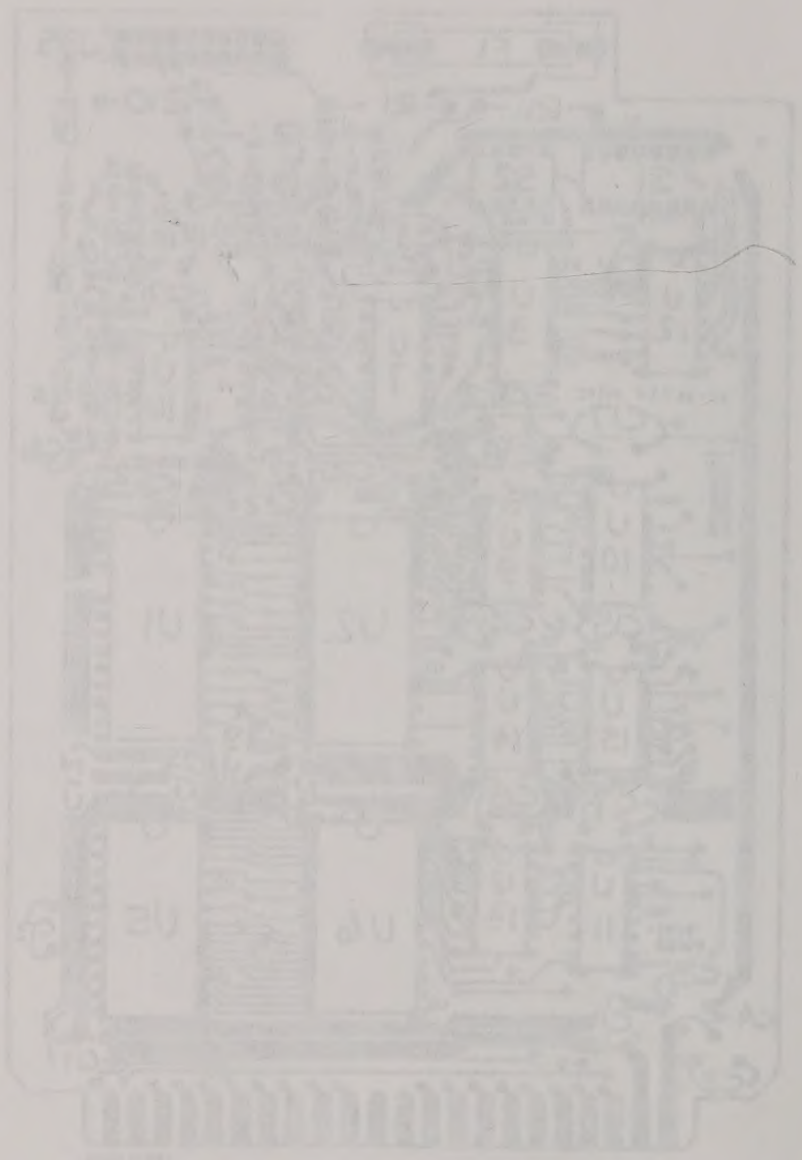


Figure 2–29. Optional TTY Interface Component Location Diagram.



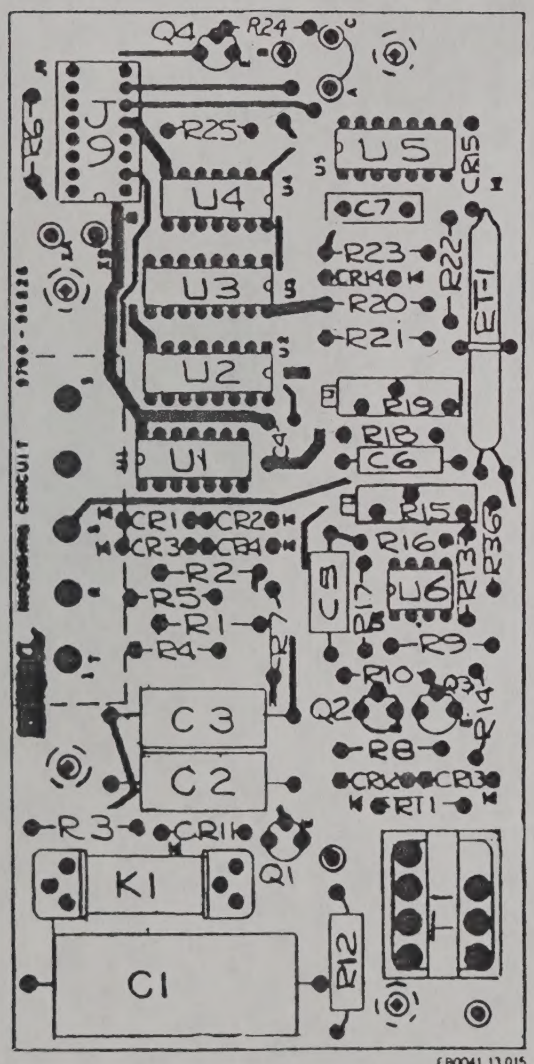


Figure 2—46. Incoming Circuit Component Location Diagram.